



Radiological Data Evaluation Project Update

BCT Meeting
Hunters Point Naval Shipyard

[DateTime]

•10-11:30 - Technical Team Update

–Provide update on database and statistical tests

–Describe identification phase

- How data will be flagged for further evaluation
- Preliminary Parcel C flags based on statistical tests

–Describe evaluation phase

- How flags will be evaluated
- Examples of 3 different Parcel C Trench Units

–Confirmation phase

- Sampling details TBD after evaluation

•11:30-12:00 - Community Team Update

The purpose of the technical part of the presentation is to provide an update on the database and statistical runs, identify the ways data will be flagged for further evaluation, and show how we ran 3 Parcel C examples through the evaluation process and the outcome. Soil sampling details will be determined after the evaluation phase is complete.



Technical Team Update

Database and Statistics Update



•Final Radiological Evaluation Database (FRED)

- ~738k records of soil data from final FSSRs and SUPRs
 - 304 Trench Units
 - 514 Fill Units
 - ~43k Samples
- Soil data from former building sites will be added

•Statistical tests

- Completed on Parcel trench and fill soil data
- Compiling summaries of results

FRED Summary

Parcel	Total Records	Total Trench Units	Total Fill Units
B	160,290	70	110
C	158,435	68	120
D-2	8,070	7	5
E	119,952	55	96
G	200,690	63	107
UC-1	32,444	12	25
UC-2	21,235	8	21
UC-3	36,874	21	30
TOTAL	737,990	304	514

Statistical tests completed on 42,547 samples from 818 trench and fill survey units. Former building area data will be added to the database and statistical tests are estimated for completion this month.

- **Identify flags (anomalous data) for further evaluation to identify potential for data manipulation and falsification**
- **Survey units will be flagged for further evaluation based on:**
 - **Statistical results**
 - **Logic test results**
 - **Time-series plots**
 - **Historically significant sites**
 - **Allegations**

A flag is only a warning to look closer, not an accusation and does not mean data was falsified. There will likely be a lot of flags that turn out as false positives.

Statistical tests:

K-S test for primary ROCs

Logic tests:

FSS samples collected on different days

FSS samples collected the same day (or earlier) as confirmatory/biased samples

Samples counted before they were collected

FSS samples analyzed over >2 days (start time (S) within 2 days)

Sample IDs are inconsistent between text and database (HP checks during review)

Time-series plots:

Look for trends in Ac-228, Bi-214, and K-40 (survey unit by survey unit basis)

Historically significant sites:

Sites where radioactivity in soil was removed (500 series area, 707 triangle, cesium spill (aka peanut spill) and sewer segments connected to impacted buildings

Allegations:

As provided by Navy/EPA

Parcel C Trench Unit Flags Based on Statistics

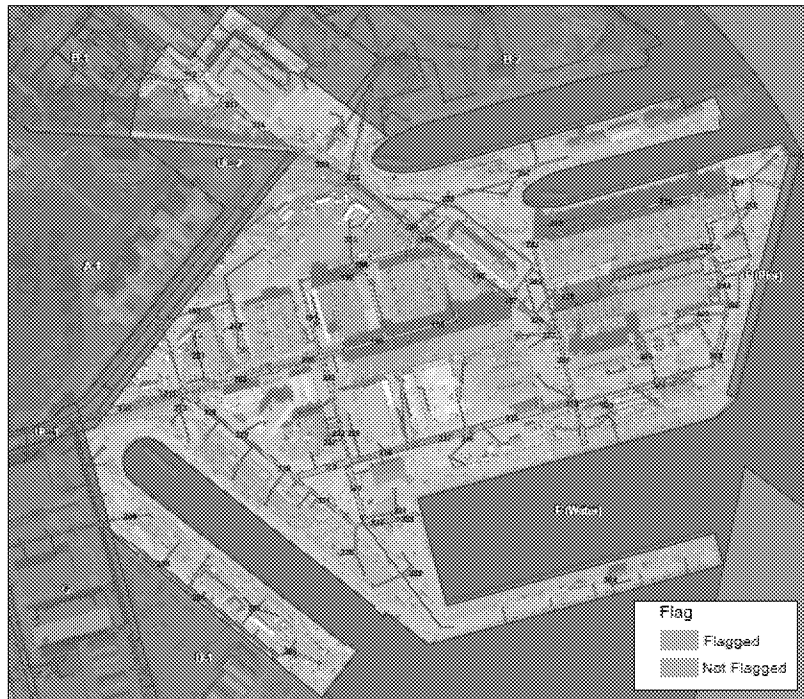


- 38 trench units flagged

- 191, 192, 194, 195,
196, 197, 198, 199,
202, 203, 205, 206,
209, 210, 219, 220,
221, 227, 234, 236,
238, 242, 243, 247,
303, 304, 312, 314,
318, 319, 320, 325,
326, 327, 331, 333,
334, 335

- 30 trench units not
flagged

- 193, 200, 207, 208,
211, 212, 213, 226,
231, 232, 233, 237,
239, 244, 302, 315,
316, 317, 321, 322,
323, 324, 328, 329,
330, 332, 336, 337,
338, 339



Visual representation of TUs flagged by the K-S test for units and/or days.

Evaluation Phase



- Conduct detailed reviews to verify anomalous data flagged during identification phase

- Document reviews
- Descriptive statistics
- Other lines of evidence

- Identify locations to collect data to confirm and/or replace potentially manipulated data

Hunters Point Final Status Survey Data Evaluation

Backfill Soil Grate Data Connections

SIOPR Review (cont.)

Hunters Point Final Status Survey Data Evaluation

Period: Survey / French Date: Building:

Readers: For Evaluation (Summary of Flagged Data)

2) 25 Test: Pass/Fail? Pass ☐ Fail ☐

Number of Pages:

2) Sample Tests: Pass/Fail?

Sample Test 1: Fil samples collected on different days

Sample Test 2: Fil samples collected the same day (for ender) as continuous/related samples

Sample Test 3: Samples collected before they were collected

Sample Test 4: Fil samples analyzed over +2 days (start date to within 2 days)

Sample Test 5: Sample IDs are inconsistent between soil and samples

3) Time Series Plot: Pass/Fail? Pass ☐ Fail ☐

4) Statistically Significant Site Location: Yes/No? Yes ☐ No ☐

5) Allegation: Yes/No? Yes ☐ No ☐

6) Requires Further Evaluation: Yes ☐ No ☐

7) Other:

8) Other:

9) Other:

10) Other:

11) Other:

12) Other:

13) Other:

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Document reviews: closure reports
Descriptive stats: mean, variance, range

Developed a form to focus and assemble results of data evaluation. Every TU, FU, SU will be evaluated and a form will be completed for each and available in the report. We are finalizing form and can share form.

Other lines of evidence: some examples of other information to be reviewed as available

Review other agency and contractor data where anomalous data was identified, pre-remediation ROC concentrations were high, or allegations were made and compare results with release criteria

CDPH analysis of split soil samples

EPA health physics surveys

Radiological data collected for the Navy by other contractors

Prior data that has not been manipulated will be considered valid and useable for property transfer decisions

Conduct site visits to verify or provide site-specific information

Conduct interviews with previous site workers – pending legal counsel approval

Perform visual inspection or re-analysis of archived samples

Perform additional statistical tests – based on results (e.g., other contractor TUs nearby for comparison)

Identify new ways to look at/evaluate/compare data

Evaluate gamma statics for consistency with soil sample results

Evaluate gamma scans for selection of confirmatory and bias sample locations

Example of Evaluation Phase Parcel C Trench Unit 198



•Flags based on:

–K-S test results

- Multiple radionuclides
- Units and days

–Time-series plots

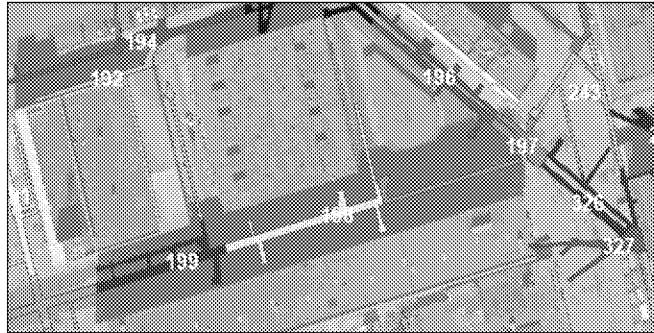
- Multiple radionuclides
- Final status survey (FSS) and post-remediation datasets not consistent with earlier samples

–Logic test results

- 4th round of bias samples counted 4 days apart

–Allegation results

- Suspect worker listed on radiation survey form



We evaluated 3 TUs to assist in process development and used the form to test.

This first is an example of a TU with anomalous results that was not previously identified by the contractor. This TU was flagged by all 4 tests.

K-S test: Ac-228, Bi-212, Bi-214, Pb-212, Pb-214, Ra-226

Time-series plots: Ac-228, Bi-214, K-40

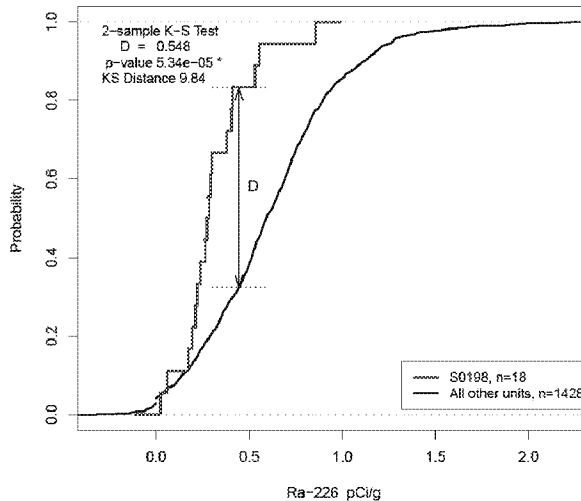
Example of Evaluation Phase Parcel C Trench Unit 198



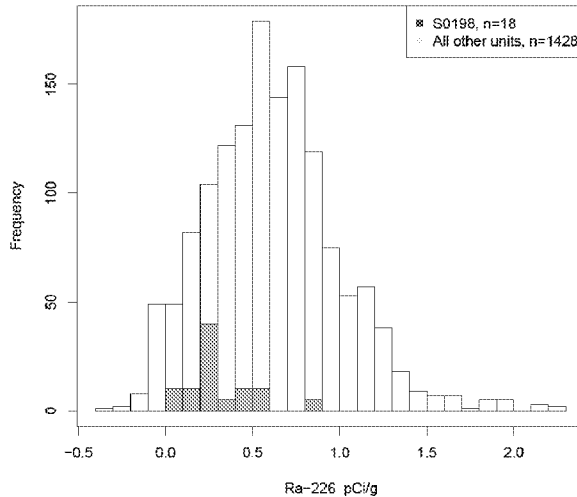
•K-S test results – flagged

–Final systematic data for Ra-226 from onsite lab

Survey Unit S0198 Ra-226 Samples in Parcel C Trenches
Final Status Survey Results from Onsite Laboratories



Survey Unit S0198 Ra-226 Samples in Parcel C Trenches
Final Status Survey Results from Onsite Laboratories



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K-S test results....multiple ROCs identified, 1 example for K-S test to identify differences between TU198 and all other Parcel C data – flagged

Example of K-S test results and histogram for Ra-226 for TU 198....compares TU198 with all other Parcel C data

P-value: probability that these represent similar distributions

Distance: measure of how different the distributions are and tells you if TU is higher or lower than all other Parcel C data
FSS data have a smaller variance and lower Ra-226 activity that the other samples collected from Parcel C

It is important to note the distribution of Ra-226 data as shown by the black line. The distribution is smooth and representative of a single data population. There is no suggestion of obvious Ra-226 contamination. Given the very small amount of Ra-226 waste potentially disposed down storm and sanitary sewer lines, and subsequent leakage from piping into soil, little to no contamination is expected.

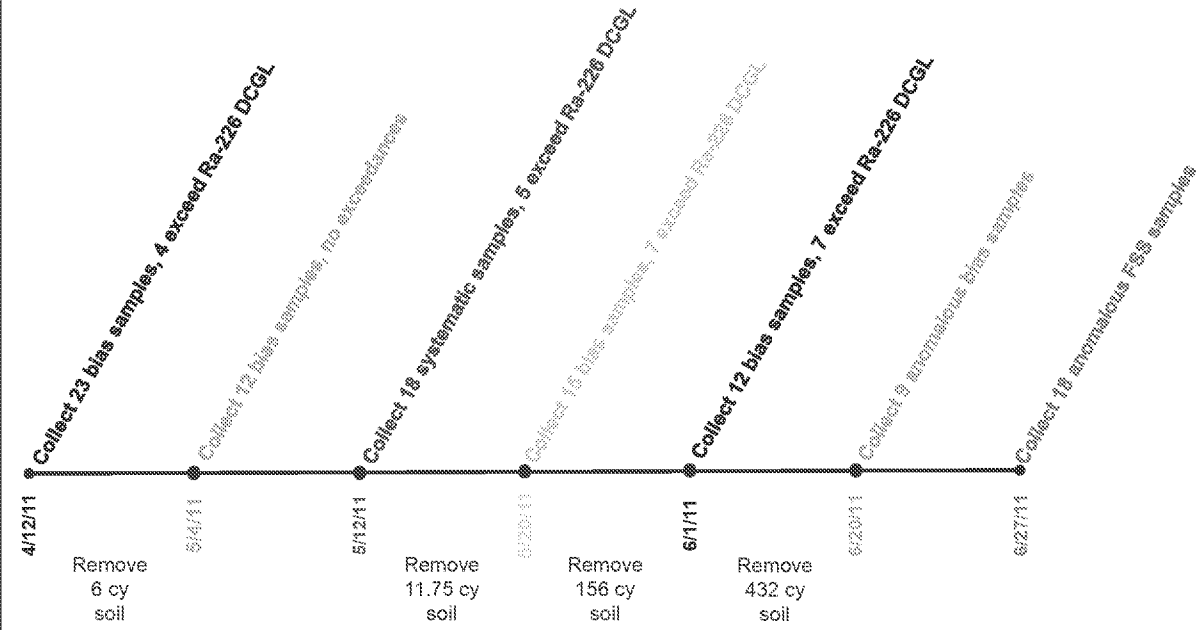
The graph demonstrates the variability of Ra-226 in soil at Hunters Point. The area to the right, while exceeding our cleanup level of one plus background, is likely the high end of naturally occurring Ra-226. Approximately 5% of the confirmatory samples are predicted to be within this range.

Histogram is just another visual to show the differences in the distributions.

Example of Evaluation Phase Parcel C Trench Unit 198



Remediation conducted due to Ra-226



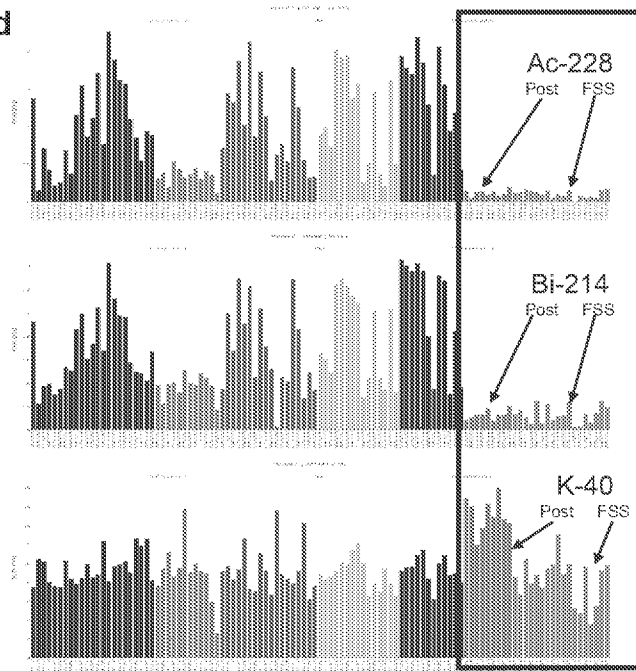
Timeline of events shows multiple rounds of remediation over time, increased volume over 4 events, flags. Unusually high volumes of excavated soil in response to exceedances, drastic increases in volume of soil removed based on similar number of Ra-226 exceedances.

Example of Evaluation Phase Parcel C Trench Unit 198



• Time-series plot results - flagged

- Soil collected from site and 2 separate sources of potentially substituted soil
- Ac-228 and Bi-214 post-remediation and FSS data potentially anomalous
- K-40 results inconsistent between pre- and post-remediation and FSS data
- Initial data suggests no exceedances of release criteria
 - Initial set of bias samples for Bi-214 results less than Ra-226 derived concentration guideline level (DCGL)



Introduce use of time-series plots to compare activity for Ac-228, Bi-214, and K-40 for pre- and post-remediation data.

Shades of red = bias samples

Shades of blue = pre-remediation systematic characterization

Green = final systematic

Different shades indicate separate rounds of sampling on different days.

All unlabeled data sets are pre-remediation.

Note that second round of bias sampling (just prior to blue, just left of blue) also shows reduced mean and increased precision for Ac-228 and Bi-214, but not K-40.

The contractor only looked at K-40 for anomalous soil report, this slide shows that if only K-40 was used, the TU would not likely be flagged.

Example of Evaluation Phase Parcel C Trench Unit 198



- **Logic test results - flagged**

- **4th round of bias samples counted 4 days apart**

- 12 samples collected Wednesday 6/1/11
 - 8 samples counted on Friday 6/3/11
 - 4 samples counted Monday 6/5/11

- **Counts were before and after a weekend**

- **Confirmed not anomalous**

Example of a flag that does not lead us to identify potential data manipulation....cannot rely on any one test.

If samples counted on different days and there is a time delay...indicates there may have been time for manipulation based on results....this one was evaluated and it was just over a weekend and so no issue.

Example of Evaluation Phase Parcel C Trench Unit 198



- **Preliminary conclusions**

- Anomalous data collected following removal of significant volumes of soil
- However, Ra-226 remediation and subsequent sampling potentially unnecessary based on more reliable Bi-214 analytical results

- **Preliminary recommendation**

- Consider reanalyzing subset of archived samples (if available) to confirm Ra-226 activity less than DCGL

Ra-226 results biased high based on accelerated analysis to facilitate remediation (open trenches/H&S), accepted conservatism to increase production.

Example of kind of information provided as conclusions and recommendations

Ra-226 biased high based on quick analysis to facilitate remediation and generates more false positives

Overly conservative estimate...with a longer analysis period...shows levels were actually much lower

Bi-214 data more reliable - no samples exceeded remediation goal, little change in results a month later

For recommendation:

If less than DCGL, no further action needed

If greater than DCGL, additional site investigation/remediation needed

Example of Evaluation Phase Parcel C Trench Unit 206



•Flags based on:

–K-S test results

- Multiple radionuclides
- Units and days

–Time-series plots

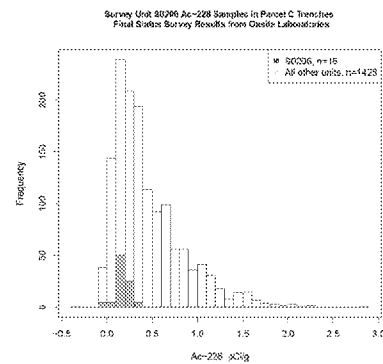
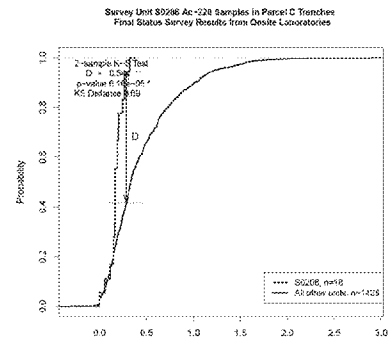
- No unusual trends identified

–Logic test results

- Samples 13 to 18 held 4 extra days before onsite lab analysis

–Allegation results

- Suspect worker listed on radiation survey form



This second is an example of a TU that was flagged by 3 of the 4 tests but determined not to be anomalous results.

K-S test Ac-228, Bi-212, Bi-214, K-40, Pb-212, Pb-214, Ra-226

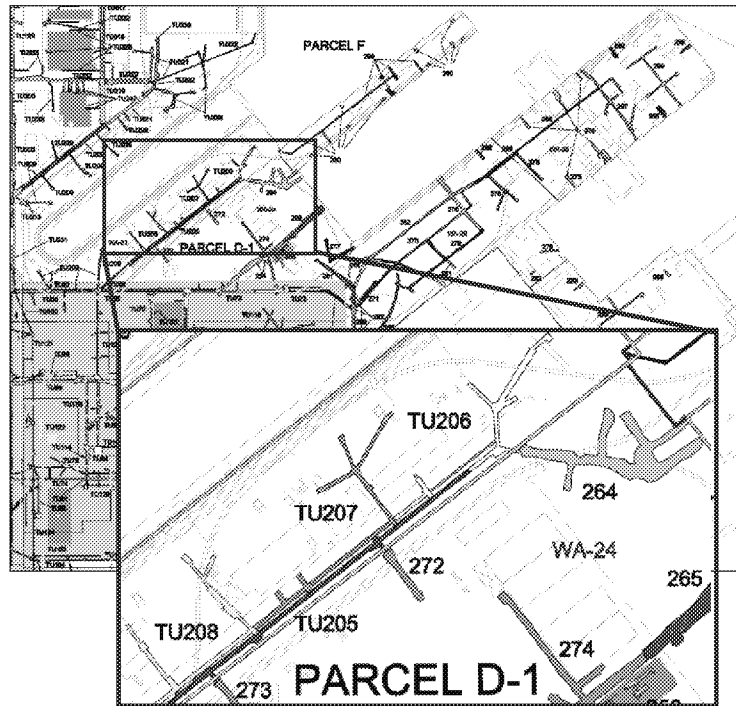
The K-S test is just a visual example showing Ac-228 results and shows thorium series activities lower than other trenches in Parcel C.

Histogram – data shifted slightly lower

Example of Evaluation Phase Parcel C Trench Unit 206



- Only 1 round of 18 FSS samples collected
 - No remediation conducted
 - No bias samples collected
- TU206 physically separated from most of Parcel C
 - South of Drydock 4 by Parcel D-1
- Reviewed time-series plots for adjacent trenches
 - Tetra Tech EC (TU205, 207, and 208)
 - Other contractors (Trenches 264 and 272)
 - Excavation data (ESU462)



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This TU is a different kind of evaluation because there are only 18 FSS and nothing to compare to. Started looking at the map and adjacent TUs to evaluate data as alternative approach.

Consistent Bi-214 data within adjacent trenches sampled by Tetra Tech EC (TU205, 207, and 208), adjacent trenches sampled by another contractor (trenches 264 and 272), and excavation data (ESU462 included soil excavated from TU206 and used as backfill for TU206).

Time-series plots show for primary ROCs allowing direct comparison with adjacent TUs. Based on direct comparisons, similar levels of radioactivity.

Example of Evaluation Phase Parcel C Trench Unit 206



- **Time-series plot results - flagged**

- All soil collected within the TU206 area has similar levels of radioactivity

- Lower than the rest of Parcel C

- Within range of naturally occurring radionuclides

- Confirmed by data collected from multiple contractors and excavated data

- **Logic test results - flagged**

- Samples counted on Friday 5/27/11 and Tuesday 5/31/11 before and after Memorial Day weekend

- Confirmed as not anomalous

Examples of results of individual tests for MLE

Example of Evaluation Phase Parcel C Trench Unit 206



- **Preliminary conclusions**

- Trench Unit 206 is physically separated from most of Parcel C
- Adjacent Parcel C and Parcel D-1 trenches have similar levels of radioactivity, lower than most of Parcel C, and not likely anomalous

- **Preliminary recommendations**

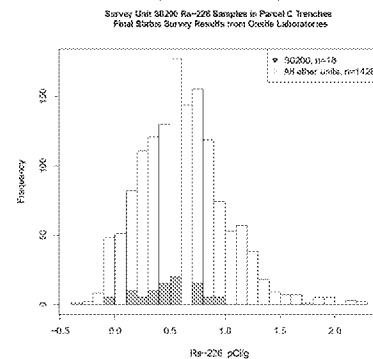
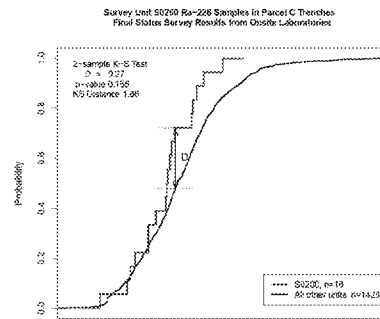
- Confirm conclusions with statistical comparisons for data collected from the area south of Drydock 4

Recommendation for statistical comparisons with other TUs:
TU205, 207, and 208
Trenches 264 and 272
ESU462

Example of Evaluation Phase Parcel C Trench Unit 200



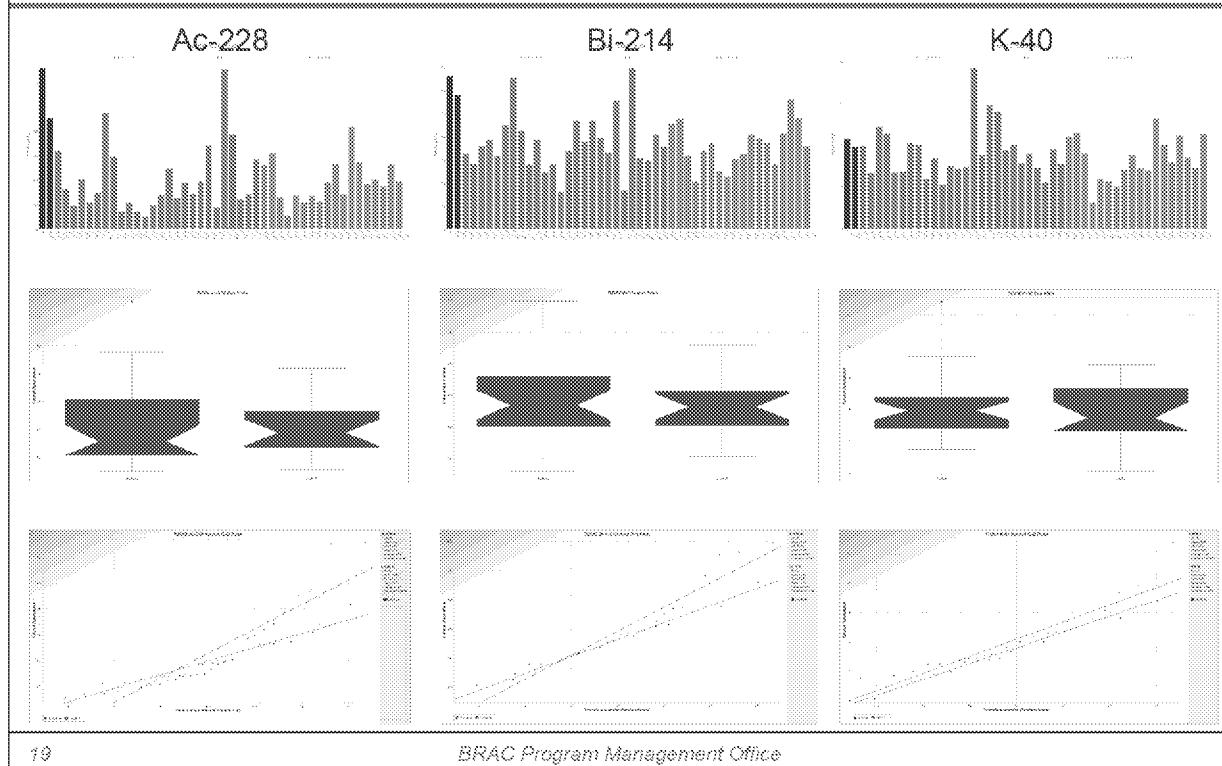
- 28 bias samples collected based on elevated Cs-137 and Ra-226 in manhole sediments, followed by 18 FSS samples
- Not flagged based on:
 - K-S test results
 - No units or days flagged
 - Time-series plots
 - No unusual trends identified
 - Logic test results
 - No inconsistencies in data collection
 - Allegation results
 - Survey technician not suspect



This third is an example of a TU that was flagged only by logic tests (not by statistics). Determined not to be anomalous results.

K-S test shows no significant differences between bias and systematic data collected at TU200 and as compared to other final systematic data collected in Parcel C.

Example of Evaluation Phase Parcel C Trench Unit 200



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This slide shows the multiple tools available for evaluating data, time-series plots, box plots, and normal Q-Q plots. All these examples show no significant differences between bias and FSS data collected at TU200.

Example of Evaluation Phase Parcel C Trench Unit 200



- **Preliminary conclusions**
 - No significant differences
 - Previous conclusions are valid
- **Preliminary recommendations**
 - No further action

No significant differences between TU200 and rest of Parcel C and between pre- and post remediation samples.

Next Steps



- **Complete identification phase for flagging data for evaluation**
- **Conduct detailed reviews on flagged data**
 - Adjust approach as new information is received
- **Plan for confirmation phase**

Community Team Update

- **Community Technical Advisor (Dr. Kathryn Higley)**
 - Attended and answered community member questions at April 8th Bus Tours
 - Two inquiries directed to Dr. Higley as a result of April 2017 HPNS newsletter
 - Greenaction (Brian Butler, Community Organizer & Policy Advocate)
 - Local resident re: radiological safety concerns
- **Community Liaison (Ms. Ellouise Patton)**
 - Attended April 8th Bus Tour (independently)
 - RAD outreach work to begin in May 2017



- **Media coverage of HPNS Radiological Program**
 - Fox Bay Area People (Claudine Wong) - aired April 22
 - NBC Bay Area News Investigative Report (Liz Wagner) - aired April 29
- **Draft Communications Plan v2.0**
 - Distributed to Tiger Team May 1